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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/822,424	04/12/2004	Bulent M. Basol	ASMNUT.029CP*	4984
20995 7590 05/18/2007 KNOBBE MARTENS OLSON & BEAR LLP 2040 MAIN STREET FOURTEENTH FLOOR IRVINE, CA 92614			EXAMINER MENDEZ, ZULMARIAM	
			ART UNIT 1709	PAPER NUMBER
			NOTIFICATION DATE 05/18/2007	DELIVERY MODE ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary

Application No.

10/822,424

Applicant(s)

BASOL ET AL.

Examiner

Zulmaria Mendez

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04/12/2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-22 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-22 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>See Continuation Sheet</u> . | 6) <input type="checkbox"/> Other: _____ |

Continuation of Attachment(s) 3). Information Disclosure Statement(s) (PTO/SB/08), Paper No(s)/Mail Date :01/16/2007, 03/01/2006 and 03/14/2005.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter, which the applicant regards as his invention.

2. Claim 18 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

With regard to claim 18, It is unclear if the multiple electrodes and isolators, forming the 2 different groups in the electrode assembly, are the same as those recited in claim 13.

For examination purposes, these components have been treated as being the same.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 1 and 2 are rejected under 35 U.S.C. 102(e) as being anticipated by Ichinose et al. (US Patent Application Publication no. 2001/0007306).

With regard to claim 1, Ichinose discloses an apparatus for electropolishing a conductive layer on a wafer using a solution, comprising: an electrode assembly immersed in the solution configured proximate to the conductive layer having a longitudinal dimension extending to at least a periphery of the wafer, the electrode assembly including: an elongated contact/work electrode (112) configured to receive a potential difference; an isolator (114) adjacent the elongated work electrode; and an elongated process/auxiliary electrode (113) adjacent the isolator configured to receive the potential difference; and a voltage supply (105) configured to supply the potential difference between the contact electrode and the process electrode to electropolish the conductive layer on the wafer.

With regard to claim 2, the elongated contact/work electrode (112) and the elongated process/auxiliary electrode (113) are configured to electropolish the conductive layer on the wafer without physical contact with the wafer (See figure 1C).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

7. Claims 3-9 and 13-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ichinose as applied to claim 1 above, and further in view of Wang (US Patent no. 6,395,152).

With regard to claim 3, Ichinose discloses all of the structure as applied to claim 1 above, but fails to teach that the electrode assembly includes a plurality of passages configured to provide solution flow through the electrode assembly. However, Wang discloses an electropolishing apparatus for polishing a metal layer formed on a wafer including fluid inlets (171, 172, 173, 174 and 175, see figure 17A) in order to deliver the electrolyte into different sections of the polishing receptacle (100) and obtain a uniform flow profile thereby (col. 20, lines 1-4).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to use multiple fluid inlets as taught by Wang, in the electropolishing apparatus of Ichinose, in order to deliver the electrolyte into different sections of the polishing receptacle and obtain a uniform flow profile throughout the system.

With regard to claim 4, Ichinose discloses all of the structure as applied to claim 1 above, but fails to teach that the electrode assembly includes a plurality of elongated contact electrodes, isolators, and elongated process electrodes. However, Wang teaches a wafer electropolisher (50) consisting of a polishing receptacle (100) divided into six sections (111-116) by section walls (109, 107, 105, 103 and 101, see figure 7A). These walls are suitable formed from any convenient material electrically insulated, to receive the potential difference, and resistant to acid and corrosion. The wafer polisher also includes three process electrodes/cathodes (1-3, see figures 7A and 7B). Any number of cathodes, whether fewer or greater than three, can be used. In general, the more cathodes used, the better film uniformity can be expected (col. 9, lines 49-54).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to use multiple isolators and electrodes as taught by Wang, in the electropolisher apparatus of Ichinose, in order to provide a better film uniformity on the metal substrate. Additionally, it has been held that mere duplication of parts has no patentable significance unless a new and unexpected result is produced In re Harza, 274 F.2d 669, 124 USPQ 378 (CCPA 1960).

With regard to claims 5-8, Ichinose fails to teach a mechanism to produce relative motion, reciprocating and rotational motions, between the electrode assembly and the conductive layer, which provides electropolishing of substantially an entire surface of the conductive layer. However, Wang discloses a drive mechanism (30) that suitably rotates a wafer (31) about the z-axis. In this manner, a more uniform electropolish can be achieved across the surface of wafer (col.11, lines 34-37, see also

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figure 7B). In another embodiment of Wang's invention, a cathode jet (255) remains stationary while the wafer is moved along the X-axis (left and right). The wafer is held by a wafer chuck, which positions the wafer within polishing receptacle (100). The cathode jet injects electrolyte onto portions of the wafer, while the wafer is rotated and moved in the X-axis simultaneously by drive means (30) and guide bar (35). When the wafer is moved to the left side, the cathode jet injects electrolyte on to the center portion of the wafer. When the wafer is moved to the right side, the cathode jet injects electrolyte onto the periphery portion of the wafer (col. 33, lines 15-24). The cathode jet can be moved instead of moving the wafer, or both jet and wafer can be moved to achieve the same results.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to use the drive mechanism of Wang, in the electropolisher apparatus of Ichinose, in order to achieve a more uniform electropolish across the surface of the wafer.

With regard to claim 9, the isolator of Ichinose doesn't protrude above a plane defined by the elongated contact electrode and the elongated process electrode. However, Wang discloses an electropolishing apparatus having insulated walls (109, 107, 105, 103 and 101, see figure 7A) protruding above a plane defined by the electrodes (1-3, See figure 7B) in order to avoid physical contact of the electrodes with the wafer (31) and further damages to its surface.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to replace the isolator of Wang, with the isolator as taught by

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Ichinose, in order to avoid physical contact of the electrodes with the wafer (31) and further damages to its surface.

With regard to claim 13, Ichinose discloses an apparatus for electropolishing a conductive layer using a solution comprising an elongated contact/work electrode (112) configured to receive a potential difference; an isolator (114) adjacent the elongated work electrode; and an elongated process/auxiliary electrode (113) adjacent the isolator configured to receive the potential difference; and a voltage supply (105) configured to supply the potential difference between the contact electrode and the process electrode to electropolish the conductive layer on the wafer. However, Ichinose fails to teach a work-piece holder configured to hold the wafer exposing the conductive layer to the solution; an electrode assembly including: a plurality of elongated contact electrodes configured to receive a potential difference; a plurality of elongated process electrodes adjacent the plurality of elongated contact electrodes configured to receive the potential difference; and a plurality of isolators adjacent the plurality of elongated contact electrodes and the plurality of elongated process electrodes and configured to insulate the potential difference between the plurality of elongated contact electrodes and the plurality of elongated process electrodes.

Wang discloses a wafer electropolisher (50) consisting of a polishing receptacle (100) divided into six sections (111-116) by section walls (109, 107, 105, 103 and 101). These walls are suitable formed from any convenient material electrically insulated, to receive the potential difference, and resistant to acid and corrosion. The wafer is held by a wafer chuck, which positions the wafer within polishing receptacle (100). The wafer

polisher also includes three process electrodes/cathodes (1-3, see figures 7A and 7B). Any number of cathodes, whether fewer or greater than three, can be used. In general, the more cathodes used, the better film uniformity can be expected (col. 9, lines 49-54).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to use multiple isolators and electrodes as taught by Wang, in the electropolisher apparatus of Ichinose, in order to provide a better film uniformity on the metal substrate. Additionally, it has been held that mere duplication of parts has no patentable significance unless a new and unexpected result is produced. In re Harza, 274 F.2d 669, 124 USPQ 378 (CCPA 1960).

With regard to claim 14, the elongated contact electrodes and the elongated process electrodes of the modified Ichinose are configured to electropolish the conductive layer on the wafer without physical contact with the wafer (See figure 7B).

With regard to claim 15, Ichinose discloses all of the structure as applied to claim 13 above, but fails to teach that the electrode assembly includes a plurality of passages configured to provide solution flow through the electrode assembly. However, Wang discloses an electropolishing apparatus for polishing a metal layer formed on a wafer having a plurality of passages, fluid inlets (171, 172, 173, 174 and 175, see figure 17A), in order to deliver the electrolyte into different sections of the polishing receptacle (100) and obtain a uniform flow profile thereby (col. 20, lines 1-4).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to use multiple fluid inlets as taught by Wang, in the electropolishing apparatus of Ichinose, in order to deliver the electrolyte into different

sections of the polishing receptacle and obtain a uniform flow profile throughout the system.

With regard to claims 16 and 17, Ichinose fails to teach a mechanism to produce relative motion and rotational motion, between the electrode assembly and the conductive layer, which provides electropolishing of substantially an entire surface of the conductive layer. However, Wang discloses a drive mechanism (30) that suitably rotates a wafer (31) about the z-axis. In this manner, a more uniform electropolish can be achieved across the surface of wafer (col.11, lines 34-37, see also figure 7B). In another embodiment of Wang's invention, a cathode jet (255) remains stationary while the wafer is moved along the X-axis (left and right). The cathode jet injects electrolyte onto portions of the wafer, while the wafer is rotated and moved in the X-axis simultaneously by drive means (30) and guide bar (35). When the wafer is moved to the left side, the cathode jet injects electrolyte on to the center portion of the wafer. When the wafer is moved to the right side, the cathode jet injects electrolyte onto the periphery portion of the wafer (col. 33, lines 15-24). The cathode jet can be moved instead of moving the wafer, or both jet and wafer can be moved to achieve the same results.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to use the drive mechanism of Wang, in the electropolisher apparatus of Ichinose, in order to achieve a more uniform electropolish across the surface of the wafer.

With regard to claim 18, the modified Ichinose discloses all of the structure as applied above to claim 13, but fails to teach a power supply configured to supply a first

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potential and a second potential difference; and the electrode assembly includes: a first group of plurality of elongated contact electrodes, isolators, and elongated process electrodes defining a first zone, the first group of plurality elongated contact electrodes and elongated process electrodes configured to receive the first potential difference to electropolish at a first rate; and a second group of plurality of elongated contact electrodes, isolators, and elongated process electrodes defining a second zone; the second group of plurality of elongated contact electrodes and elongated process electrodes configured to receive the second potential difference to electropolish at a second rate. However, Wang discloses an apparatus for electropolishing a metal layer formed on a wafer comprising different power supplies (13, 12 and 11) that can apply different current densities to the cathodes (1, 2 and 3). For example, the current applied by the power supplies can be set proportional to the surface area of the wafer that is covered by the corresponding cathodes. Accordingly, if the surface area of the wafer covered by cathode (3) is larger than that covered by cathode (2), power supply (11) can be set to apply more current than power supply (12). In this manner, the rate of electropolishing can be controlled to facilitate a more uniform etching of the surface of the wafer (col. 11, lines 10-19).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to use multiple power sources connected to different groups of electrodes, as taught by Wang, in the electropolishing apparatus of Ichinose in order to control the rate of electropolishing and facilitate a more uniform etching of the surface of the wafer.

With regard to claims 19-21, the first and second groups, of the apparatus as disclosed by the modified Ichinose, include a plurality of consecutive elongated contact electrodes, isolators, and elongated process electrodes where the isolators of the first group and the second group of the modified Ichinose, protrudes above a plane defined by the elongated contact electrodes and the elongated process electrodes/ cathodes (1, 2, 3) of the first group and the second group (see figure 20B).

8. Claims 10-12 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ichinose and Wang as applied to claims 9 and 21 above, and further in view of Uzoh (US Patent no. 5,807,165).

With regard to claims 10-12 and 22, the modified Ichinose discloses all of the structure as applied to claims 9 and 21 above, but fails to teach that the isolator includes a pad, disposed on its surface, having an abrasive top surface to contact the conductive layer and planarize the conductive layer. However, Uzoh discloses a method and apparatus for planarizing a layer comprising a rotatable work-piece carrier (66), a rotatable platen (62), which may be formed of an insulative material, arranged proximately to the carrier, a polishing pad (64) mounted on the platen, work-piece electrodes (67) to engage the minor sides of a layer when a work-piece is held on the carrier; a means for urging the carrier against the pad, and a slurry supply system in fluid communication with the pad. The slurry is a suitable aqueous electrolyte including abrasive particles (col. 5, lines 43-54). The pad containing the abrasive solution contacts the wafer (W) in order to increase the throughput for planarizing work-pieces

and to planarize a semiconductor wafer while reducing damage to microelectronic components located on the wafer (See figure 11a).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to use the polishing pad containing abrasive particles, as taught by Uzoh, in the electropolishing apparatus of the modified Ichinose in order to increase the throughput for planarizing work-pieces and to planarize a wafer while reducing damage to the components located on the wafer.

Conclusion

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Zulmariam Mendez whose telephone number is 571-272-9805. The examiner can normally be reached on Monday-Thursday, 8:30am-5:00pm, EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexa Neckel can be reached on 571-272-1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

ZM *zm*

Barbara Gilliam
**BARBARA GILLIAM
PRIMARY EXAMINER**